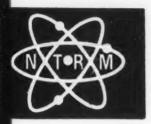
# **Nuclear Tracks and Radiation Measurements**

Including Thermoluminescence

International Journal of Radiation
Applications and Instrumentation Part D



Volume 13 1987
Volume Contents and Author Index

Editor-in-Chief

S. A. Durrani, University of Birmingham, U.K.

Associate Editor U.S.A.

E. V. Benton, University of San Francisco, U.S.A.



PERGAMON PRESS

OXFORD · NEW YORK · BEIJING · FRANKFURT SÃO PAULO · SYDNEY · TOKYO · TORONTO

# NUCLEAR TRACKS AND RADIATION MEASUREMENTS

INTERNATIONAL JOURNAL OF RADIATION APPLICATIONS AND INSTRUMENTATION PART D

Editor-in-Chief

S. A. Durrani, Ph.D. (Cantab.), D.Sc., F. Inst.P., Department of Physics, University of Birmingham, P.O. Box 363, BIRMINGHAM B15 2TT, England. Tel: 021-472 1301. Telex: 338 938 SPAPHY G.

Associate Editor U.S.A.

Prof. E. V. Benton, Department of Physics, University of San Francisco, SAN FRANCISCO, CA 94117, U.S.A.

Regional Editors

Western Europe: Dr W. Enge, Institut für Reine und Angewandte Kernphysik, Universität Kiel, D-2300 KIEL, Fed. Rep. Germany (Editor-in-Charge, Educational Section)

Asia and Australasia: Prof. D. Lal, F.R.S., Physical Research Laboratory, AHMEDABAD 380 009, India

**Book Reviews Editor** 

Dr D. O'Sullivan, School of Cosmic Physics, Institute for Advanced Studies, 5 Merrion Square, DUBLIN, Eire.

Dr L. Tommasino, Laboratory for Dosimetry and Biophysics of CNEN, P.O. Box 2400, 00100-ROMA-Casaccia, Italy

Conferences Editor
Prof. Dr K. Becker, Deutsches Institut für Normung, Pf. 1107, D-1000 BERLIN 30, Fed. Rep. Germany

Editorial Advisory Board

Prof. Dr R. Brandt, Kernchemie, Philipps-Universität, F.B.14, D-3550 MARBURG-Lahnberge, Fed. Rep. Germany
Prof. L. T. Chadderton, Division of Chemical Physics, CSIRO, P.O. Box 160, CLAYTON, Victoria, Australia 3168
Dr T. Doke, Science and Engineering Research Lab., Waseda University, Kikui-Cho, Shinjuku, TOKYO 162, Japan
Dr R. L. Fleischer, General Electric Co., Research and Development Center, SCHENECTADY, NY 12301, U.S.A.
Prof. P. H. Fowler, F.R.S., H. H. Wills Physics Laboratory, BRISTOL BS8 1TL, England
Mr J. A. B. Gibson, Environmental and Medical Sciences Division, AERE, HARWELL OX11 0RA, England
Dr Shi-lun Guo, Institute of Atomic Energy, Academia Sinica, P.O. Box 275-2, BEIJING, P.R. China
Prof. R. Katz, Behlen Laboratory of Physics, University of Nebraska, LINCOLN, NE 68588, U.S.A.
Prof. P. W. Levy, Physics Department, 510B, Brookhaven National Laboratory, UPTON, NY 11973, U.S.A.
Prof. J. F. Lovering, The Flinders University of South Australia, BEDFORD PARK, South Australia 5042
Dr V. Mejdahl, NLT Riso, DK-4000 ROSKILDE, Denmark
Dr M. Monnin, Laboratoire de Physique Corpusculaire, Université de Clermont, 63170 Aubière, CLERMONT, F Dr W. Mejdahl, NLT Riso, DR.-4000 ROSKILDE, Denmark
Dr M. M. Monnin, Laboratoire de Physique Corpusculaire, Université de Clermont, 63170 Aubière, CLERMONT, France
Dr H. G. Paretzke, Institut für Strahlenschutz, GSF, D-8042 Neuherberg, MUNICH, Fed. Rep. Germany
Dr V. P. Perelygin, Joint Institute for Nuclear Research, DUBNA, P.O. Box 79, 101000 MOSCOW, U.S.S.R.
Mr E. Piesch, Kernforschungszentrum, Weberstraße 5, Pf. 3640, D-7500 KARLSRUHE 1, Fed. Rep. Germany
Mr P. P. Szabó, Central Research Institute for Physics, H-1525 BUDAPEST, Hungary
Dr J. W. N. Tuyn, Health and Safety Department, CERN, CH-1211 GENEVA-23, Switzerland
Prof. G. A. Wagner, Max-Planck-Institut für Kernphysik, Pf. 10 3980, D-6900 HEIDELBERG 1, Fed. Rep. Germany

**Publishing, Subscription and Advertising Offices** 

Pergamon Press plc, Headington Hill Hall, OXFORD OX3 0BW, England (Tel: 0865-64881; Telex 83177)

Annual Subscription Rates (1988) (including postage and insurance)

Annual institutional subscription rate (1988): Part A, Applied Radiation and Isotopes DM 1000.00; Part B, Nuclear Medicine and Biology
DM 500.00; Part C, Radiation Physics and Chemistry DM 1145.00; Part D, Nuclear Tracks and Radiation Measurements DM 675.00; Part E,
Nuclear Geophysics DM 370.00. (2-yr subscription rates: Part A, DM 1900.00; Part B, DM 950.00; Part C, DM 2175.50; Part D, DM 1282.50;
Part E, DM 703.00.) Combined subscription Parts A-E, 1-yr DM 3150.00; 2-yr DM 5985.00. Personal subscription rate for those whose
library subscribes at the regular rate (1988): Part A, DM 185.00; Part B, DM 135.00; Part C, DM 185.00; Part D, DM 176.00; Part E,
DM 176.00. Subscription enquiries from customers in North America should be sent to: Pergamon Press Inc., Maxwell House, Fairview Park,
Elmaford, NY 10523, US.A., and for the remainder of the world to: Pergamon Press plc, Headington Hill Hall, OXFORD OX3 0BW,
England. Prices are subject to amendment without notice.

Microform and Back Issues: Back issues of all previously published volumes are available direct from Pergamon Press. Back issues of Pergamon journals in microform can be obtained from UMI. 300 North Zeeb Road. Ann Arbor, MI 48106, U.S.A.

### Published quarterly from 1987

Copyright © 1988. Pergamon Press plc

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is secepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

U.S. Copyright Law Applicable to Users in the U.S.A. The Item-fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copyring by Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copyring by Copyring Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copyring by Copyring Clearance Center Inc., 27 Congress Street, Salem, MA 01970.

Permission for other use. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works or for resale. Specific written permission must be obtained from the publisher for such copying.

The Item-fee Code for this publication is: 0191-278X/88 \$3.00 + .00

## **VOLUME CONTENTS**

### Volume 13 Number 1

Volume 13 Number 1		
S. A. Durrani	1	Editorial
K. James, Matiullah and S. A. Durrani	3	A computer program for calculation of the dose-equivalent response of fast-neutron dosemeters based on electrochemically etched CR-39 detectors
R. Keil, M. Pahl and E. Bertagnolli	25	Thermal history and length distribution of fission tracks: part II
Myung-Shik Jin, A. J. W. Gleadow and J. F. Lovering	35	Fission track age of apatite from the Jurassic and Cretaceous granites in South Korea and its tectonic implications
M. A. Fadel, W. A. Khalil, A. M. Nassar and M. H. Abou Taleb	43	Effect of fission fragments on the electric properties of phosphate glasses and their application in personal neutron dosemetry
C. Christodoulides	47	Influence of ground temperature variations and other factors on the accuracy of thermoluminescence dating methods based on the shape of glow curves
T. Hashimoto, K. Yokosaka and H. Habuki	57	Emission properties of thermoluminescence from natural quartz—blue and red TL response to absorbed dose
Short Communications Matiullah, C. Taylor and S. A. Durrani	67	An integrated-circuits based variable power supply for electrochemical etching
G. Saint Martin, R. Mazzei, O. A. Bernaola, J. C. Bourdin, C. Grasso and B. Molinari de Rey	71	Solvent effect in nuclear track development
A. J. Khan, A. K. Varshney, Rajendra Prasad and R. K. Tyagi	77	The indoor concentration of radon and its daughters in a multi-storey building
T. V. Ramachandran, B. Y. Lalit and U. C. Mishra	81	Measurement of radon permeability through some membranes
Educational Section		
G. Jönsson	85	Indoor radon gas and its detection with Kodak plastic film
Announcements	93	Fourteenth International Conference on Solid State Nuclear Track Detectors (SSNTDs)
	93	Sixth International Fission-Track Dating Workshop
New Patents	i	
Software Survey Section	1	
Volume 13 Numbers 2/3		
S. A. Durrani	95	Obituary—György Somogyi, 1937-1987
M. T. Ghoniem, H. H. Heckman and Y. J. Karant	99	Charge measurements of stopping high-Z nuclei (6 $\leq$ Z $\leq$ 92) in nuclear emulsion
A. C. W. V. Clarke and A. Carter	105	Handling of counting data for fission track dating
A. S. Pradhan	111	Fast-neutron response of sensitized LiF TLD-700

S. A. Durrani	95	Obituary-György Somogyi, 1937-1987
M. T. Ghoniem, H. H. Heckman and Y. J. Karant	99	Charge measurements of stopping high-Z nuclei (6 $\leqslant$ Z $\leqslant$ 92) in nuclear emulsion
A. C. W. V. Clarke and A. Carter	105	Handling of counting data for fission track dating
A. S. Pradhan	111	Fast-neutron response of sensitized LiF TLD-700
Y. Kirsh, P. D. Townsend and S. Shoval	115	Local transitions and charge transport in thermoluminescence of calcite
N. D. Naeser, P. K. Zeitler, C. W. Naeser and P. F. Cerveny	121	Provenance studies by fission-track dating of zircon-etching and counting procedures

Takahiro Tagami	127	Determination of zeta calibration constant for fission track dating
Matiuliah, A. A. Aslam, K. James and S. A. Durrani		A computer program for the development of a fast-neutron spectrometer based on electrochemically etched CR-39 detectors with radiators and degraders
Short Communications A. K. Ganguly, B. Chaudburi, B. Mitra, S. Sen and B. B. Baliga	139	CR-39 and detection of very high-energy neutrons
K. James and S. A. Durrani	143	Temperature dependence of heavy-ion track registration in crystals: implications for cosmic-ray and fission tracks in meteorites
Ching-shen Su	147	The radiation effects of gammas and neutrons on cellulose nitrate
Conference Report Matiullah	151	Workshop on "Development of Personnel Neutron Dosemeters based on Track Etch Detectors"
Book Review	155	
Erratum	157	
New Patents	j.	
Volume 13 Number 4		
S. A. Durrani	159	Editorial—Robert Maxwell and the founding of the journal Nuclear Track Detection
M. S. Khalifa, I. J. M. Al-Khalifa and S. A. Durrani	161	Effects of radiation damage on thermoluminescence spectra and crystal structure of natural sphene and epidote
I. J. M. Al-Khalifa, M. S. Khalifa and S. A. Durrani	171	Effect of annealing on the phototransfer-thermoluminescence (PTTL) properties of epidote and sphene
G. W. Berger, R. A. Lockhart and J. Kuo	177	Regression and error analysis applied to the dose–response curves in thermoluminescence dating
I. J. M. Al-Khalifa and J. V. Major	185	Comparison of Monte Carlo simulations with fission track observations in apatite
M. L. Readhead	197	Thermoluminescence dose rate data and dating equations for the case of disequilibrium in the decay series
Kunihiko Nishiizumi	209	53Mn, 26Al, 10Be and 36Cl in meteorites: data compilation
Short Communication Tomoaki Sumii, Takahiro Tagami and Susumu Nishimura	275	Anisotropic etching character of spontaneous fission tracks in zircon
Conference Reports  B. B. Baliga	270	Fifth National Seminar on Solid State Nuclear Track Detectors
G. W. Berger, M. Ikeya and A. K. Singhvi	281	
Announcements	287	
	287	Seventh International Conference on Geochronology, Cosmo- chronology and Isotope Geology
Book Review	289	
New Patents	i	

Volume Contents and Author Index, Volume 13, 1987

